

HIRSCH et al
Appl. No. 10/051,462
November 10, 2005

AMENDMENTS TO THE DRAWINGS

The attached sheet of drawings includes formal drawings for Fig. 1 and Fig. 2 and a replacement sheet having drawing changes to Fig. 3.

HIRSCH et al
Appl. No. 10/051,462
November 10, 2005

REMARKS/ARGUMENTS

Reexamination of the captioned application is respectfully requested.

A. SUMMARY OF THIS AMENDMENT

By the current amendment, Applicants basically:

1. Editorially amend the specification.
2. Provide a replacement sheet for Fig. 3, and formal drawings for each of Figs. 1 – 3 (see attachment).
3. Add new dependent claims 21 - 26.
4. Respectfully traverse all prior art rejections.

B. PATENTABILITY OF THE CLAIMS

Claims 1, 3-13, 15-17 and 19 stand rejected under 35 USC 102(b) as being anticipated by U.S. Patent 5,655,057 to Takagi (see enumerated paragraph 4 of the Office Action). Claims 2, 14 and 18 stand rejected under 35 USC §103(a) as being unpatentable over U.S. Patent 5,655,057 to Takagi in view of U.S. Patent 6,044,341 to Takahashi (see enumerated paragraph 6 of the Office Action). Claim 20 stands rejected under 35 USC §103(a) as being unpatentable over U.S. Patent 5,655,057 to Takagi in view of U.S. Patent 6,574,601 to Brown et al (see enumerated paragraph 7 of the Office Action). All prior art rejections are respectfully traversed for at least the following reasons.

U.S. Patent 5,655,057 to Takagi generally teaches an averaging approach that includes calculation of mean values over a complete utterance. That the calculation of Takagi is over a complete utterance is apparent from col. 5, lines 9 to 15 and col. 8, lines 13 to 21. Therefore, the Takagi approach has the same drawbacks as the CMN technique acknowledged in the introductory portion of Applicants' specification. That is, the recognition process can only start at the end of the utterance (but cannot be performed in real time, as explained on page 4, lines 6 – 10 of Applicants' specification).

HIRSCH et al
Appl. No. 10/051,462
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In contrast to U.S. Patent 5,655,057 to Takagi, Applicants' independent claims are based on individual short-term speech spectra as explained on page 5, lines 22 to 25 of the specification. For example, the method of independent claim 1 and structure/technique of other independent claims 14, 15, 17, and 19 allow for real time compensation of the (individual) short-term speech spectra as outlined, e.g., in limitation d) of independent claim 1, without the necessity of performing an averaging over a complete utterance.

The fact that Applicants' independent claims do not rely on an averaging mechanism over a complete utterance is reflected by the difference as regards the estimation of the frequency response. Unfortunately, the Office Action takes an incorrect interpretation of the phrase "frequency response". According to the interpretation of the Office Action, "spectra represent 'a frequency response' because a spectrum of speech gives an amplitude for each speech frequency" (see page 4, second paragraph of the Office Action). However, the term "frequency response" has a clear technical meaning to the person skilled in the art. This is reflected both in Applicants' specification and in U.S. Patent 5,655,057 to Takagi. As becomes evident by comparing the formula at the end of page 1 of Applicants' specification with formulas (3) and (4) of Takagi, the channel distortion A_v/A_w ("A", for sake of brevity hereafter) of Takagi equals the square of the frequency response $H(f)$ as employed in Applicants' specification. Accordingly, the frequency response of Applicant's independent claims has to be compared with channel distortion A.

A difference between the subject matter of Applicants' independent claims and U.S. Patent 5,655,057 to Takagi thus becomes evident. For example, according to step c) of independent claim 1, the frequency response is estimated by taking into account both the distorted short-term speech spectra and the corresponding reference speech spectra. This is reflected by the formula

HIRSCH et al
 Appl. No. 10/051,462
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$$\log [|H(f)|^2] = 1/T \sum_t \{ \log [Y(t,f)] - \log [S(t,f)] \}$$

where $Y(t,f)$ stands for the distorted short-term speech spectra and $S(t,f)$ stands for corresponding reference speech spectra (see, e.g., page 15 of the specification). Accordingly, each individual frequency response value is determined taking into account at least one distorted short-term speech spectra and at least one corresponding reference speech spectrum. It should be noted here that the sum over t can be chosen to include only a few elements (in the extreme case only a single element) as described on page 5, lines 29 to 37. Accordingly, the frequency response can be essentially estimated in real time without the necessity of the Takagi technique of averaging over the complete utterance (see, also, page 5, lines 29 to 34 of Applicants' specification).

On the contrary, U.S. Patent 5,655,057 to Takagi teaches estimation of channel distortion A either taking into account only the distorted speech (as illustrated by equation [9]) or only the reference speech (as illustrated by equation [10]). In other words, U.S. Patent 5,655,057 to Takagi does not estimate a single frequency response value taking into account both distorted short-term speech spectra and corresponding reference speech spectra as specified (for example) in feature c) of independent claim 1.

Additionally, the channel distortion A is calculated by U.S. Patent 5,655,057 to Takagi in accordance with $A = 1/K * (S-n)$. S is the average spectrum of a portion corresponding to the speech region, whereas N is the average spectrum of a portion corresponding to the noise region, each average being taken over the complete utterance (see col. 6, lines 22 to 57). This averaging illustrates that the channel distortion A of Takagi becomes only available once the complete utterance has been processed. On the other hand, as mentioned above, Applicants' independent claims (for example, feature c) of independent claim 1) results in a frequency response value even if only a single short-term speech spectrum is available (see page 5, lines 34 to 37 of Applicants' specification).

HIRSCH et al
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Thus, Applicants' independent claims distinguish over U.S. Patent 5,655,057 to Takagi by having, e.g., a different approach for estimating the frequency response. This different approach is reflected by the fact that Applicants' frequency response is estimated taking into account both the distorted short-term speech spectra and the corresponding reference speech spectra, whereas Takagi estimates a corresponding channel distortion based on either the distorted speech or the reference speech. In contrast to U.S. Patent 5,655,057 to Takagi, Applicants do not require averaging over complete utterances, which affords Applicants the significant benefit of real time processing.

C. MISCELLANEOUS

In view of the foregoing and other considerations, all claims are deemed in condition for allowance. A formal indication of allowability is earnestly solicited.


The Commissioner is authorized to charge the undersigned's deposit account #14-1140 in whatever amount is necessary for entry of these papers and the continued pendency of the captioned application.

Should the Examiner feel that an interview with the undersigned would facilitate allowance of this application, the Examiner is encouraged to contact the undersigned.

HIRSCH et al
Appl. No. 10/051,462
November 10, 2005

Respectfully submitted,

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